ANNOTATIONES ZOOLOGICAE JAPONENSES
Volume 53, No. 4—December 1980

Published by the Zoological Society of Japan

Taxonomic Studies on the Japanese Oribatid Mites Wearing Nymphal Exuviae

II. *Basilobelba parmata* sp. nov.

With 43 Text-figures

Toshitsugu OKAYAMA

Department of Soil Zoology, Institute of Environmental Science and Technology, Yokohama National University, Yokohama, Kanagawa 240, Japan

ABSTRACT A new species of oribatid mite, *Basilobelba parmata* (Oribatida: Basilobelbidae) is described from southern islands of Japan. Description of nymphal stages is also given. The adult of the new species shows strong ventral neotrichy, which was considered to be characteristic of the genus *Xyphobelba*. Hereby the generic characters of *Basilobelba* and *Xyphobelba* are revised.

The family Basilobelbidae now consists of two genera, *Basilobelba* Balogh, 1958, and *Xyphobelba* Csiszár, 1961. Aoki (1968), in his description of a new species, which was the second representative of the genus *Xyphobelba*, gave a synopsis of distinguishing characters of the two genera in the family Basilobelbidae. According to this system, the new species described here shows dual features, making the author revise the generic characters.

Basilobelba parmata sp. nov.

[Harage-kago-seoidani]

(Figs. 1–18, 20–43)

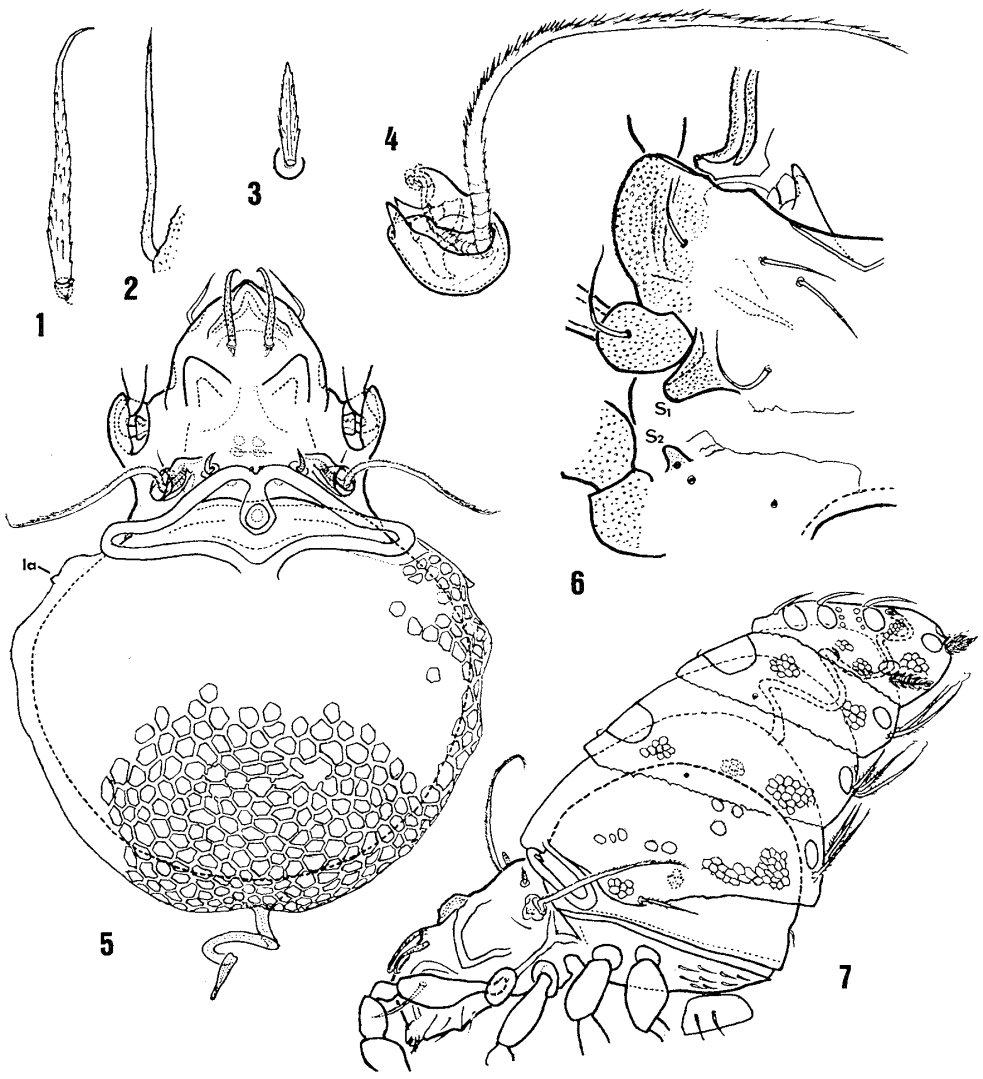
Basilobelba sp. A: Aoki, 1976, p. 97.

ADULT

Measurement. Body length: 410–440 μ; width: 290–310 μ.

Prodorsum. Rostrum rounded with its tip just weakly protruding. Rostral seta inserted on a small concavity located laterally below tutorium, being elbowed near its basal part, where very fine barbs are recognized. Lamellar setae situated near and parallel to each other on prodorsum, being long, decumbent and strongly roughened; their pointed tips being weakly curved downwards. Interlamellar seta

situated on a vestige of tubercle, being as thick and strongly roughened as lamellar one, but short, errect and weakly arched. The former scarcely reaching half the length of the latter. The mutual distance of interlamellar setae twice as long as that of lamellar setae. Interspace between bothridia narrower than usual, each bothridium being apart from the lateral margin of prodorsum; sharp spines found on the median side of bothridium (Fig. 4). Sensillus long, thick and setiform, bearing dense barbs, which become shorter and denser to the basal portion. The radix of sensillus scaled. Exobothridial seta short and fine, weakly curved. A pair of prominent triangular protrusions are present; their anterior tip almost reaching the level

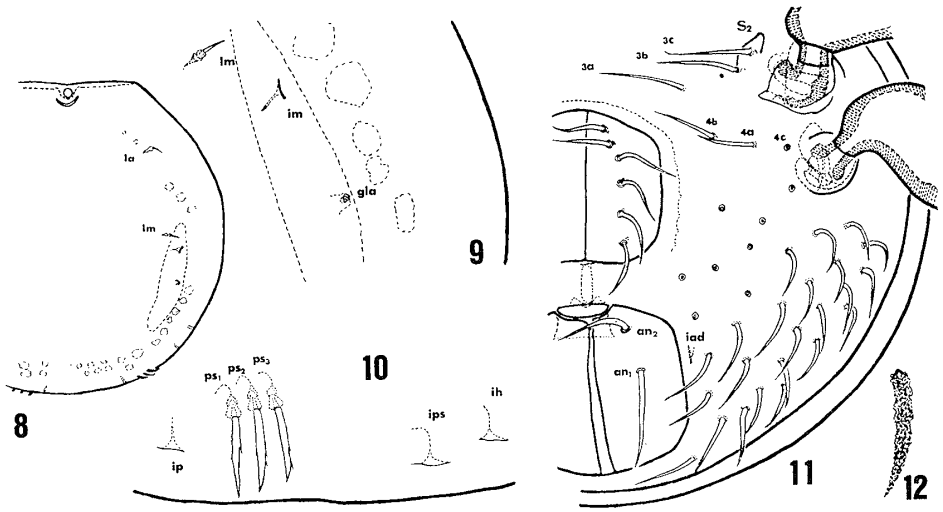


Figs. 1–7. *Basilobelba parmata* sp. nov., adult. —— 1. Lamellar seta. 2. Rostral seta. 3. Interlamellar seta. 4. Sensillus and bothridium. 5. Dorsal aspect with tritonymphal exuvia (tritonymphal setae removed). 6. Epimeral region (right side). 7. Lateral aspect with larval, protonymphal, deutonymphal and tritonymphal exuviae.

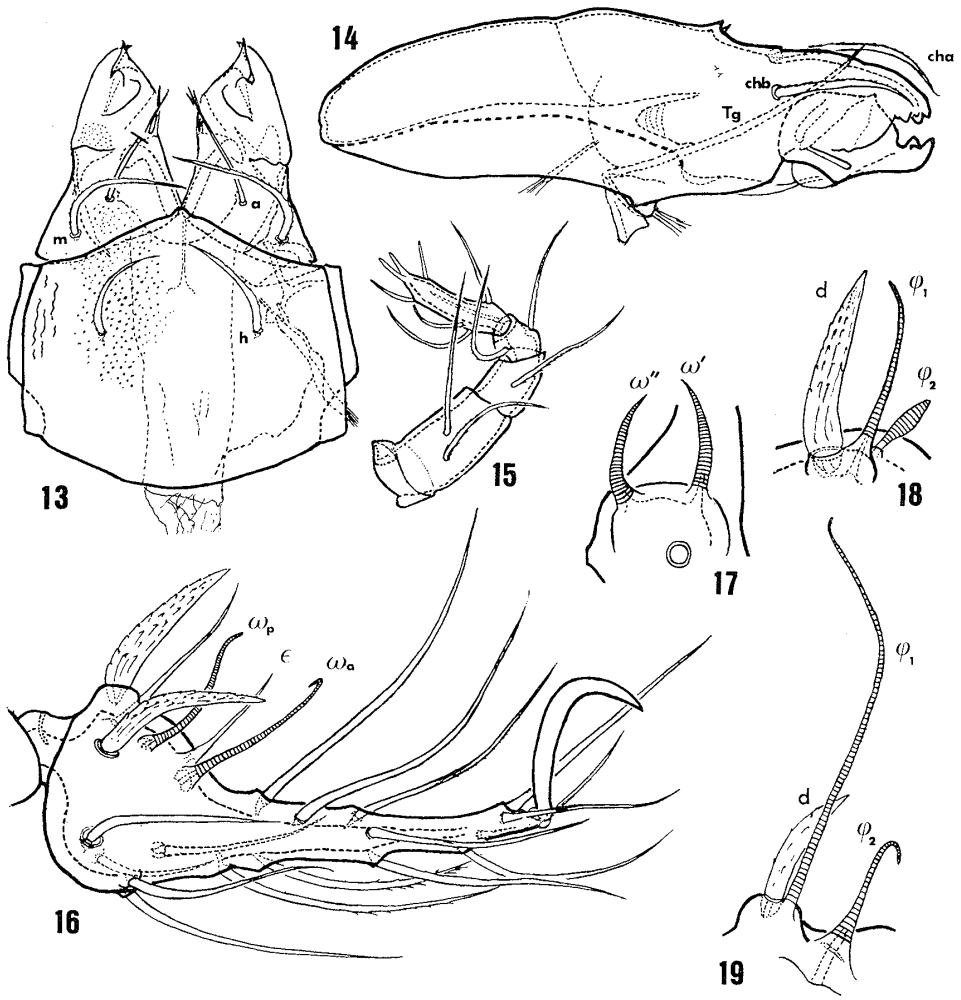
of lamellar setae insersions (Fig. 5). Another pair of ridges meeting near the tip of rostrum; the rostral ridges invaded posteriorly by a sharply pointed tip of an arched structure. A short but strong ridge situated anteromedially of bothridium. Pedotectum I well developed. Prodorsum densely covered by granular cerotegument. A few pairs of light spots found between interlamellar setae.

Notogaster. Well swollen and hemispherical notogaster wearing four-layered (larval, protonymphal, deutonymphal and tritonymphal) exuviae, which are heaped up like a tower inclined posteriorad (Fig. 7). After removal of the exuviae, glabrous surface of notogaster appears, bearing five pairs of minute setae and four pairs of lyrifissures. Setae *la*, *lm* and lyrifissure *im* well visible in dorsal aspect (Figs. 8–9). The other setae (ps_1, ps_2, ps_3) and lyrifissures (*ih*, *ips*, *ip*) located near the posterior margin of notogaster and well recognizable in the posterior view (Fig. 10). Setae *ps*-series short, but three times as long as and much thicker than seta *la* or *lm*. Setae ps_1, ps_2 and ps_3 provided with a few barbs and situated very close together; in rare case, a shorter additional seta appears lateral to the setae of *ps*-series. Lyrifissure *ia* not detected. Anterior margin of notogaster straight with its median part a little concave. Marginally on notogaster are found irregular light spots.

Anogenital region. Anal opening a little longer and wider than genital opening; each opening slightly longer than wide. Preanal plate trapezoid with only its anterior part exposed throughout its width. Adanal lyrifissure *iad* aligned longitudinally along the lateral margin of anal plate. Six pairs of uniseriate genital setae and 2 pairs of anal setae are present. Ventral plate shows strong neotrichy, so that it is impossible to discriminate between aggenital setae and adanal ones; these setae arranged irregularly and asymmetrically; the number of setae on ventral plate varies approximately from 26 to 31 in one side. Anal setae longer and thicker than aggeni-



Figs. 8–12. *Basilobelba parmata* sp. nov., adult. —— 8. Notogaster. 9. Lateral part of notogaster. 10. Posterior part of notogaster. 11. Anogenital region. 12. One of the ventral setae thickly covered by cerotegument.



Figs. 13–19. 13–18. *Basilobelba parmata* sp. nov., adult. —— 13. Ventral view of infracapiturum. 14. Celicera (antiaxial side). 15. Palp (ventral view). 16. Tarsus I (antiaxial side). 17. Two solenidia on tarsus II. 18. Dorsal seta *d* and two solenidia on tibia I. 19. *Xyphobelba setosa* Aoki, 1968. —— Dorsal seta *d* and two solenidia on tibia I.

tal-addanal setae, which are meanwhile longer and thicker than genital setae. Genital setae almost of the same length, whereas g_5 and g_6 seems to be somewhat longer. Seta an_1 a little longer than an_2. Anogenital region covered by amorphous cerotegument, which sometimes makes ventral setae monstrous as shown in Fig. 12. Ventral setae, which are often broken off, weakly roughened even after the removal of the cerotegument.

Epimeral region. Epimerata completely fused, leaving a weak trace of apodemata SJ. Epimeron II with a well-recognized protuberance S_1 near its lateral margin. Epimeron III bears also a protuberance S_2 which is much smaller than S_1. Formula of epimeral setae: (3–1–3–3); 3*c* and 3*b* situated close together near the base of S_2. Epimeral setae long, rather thin and pointed at tip.

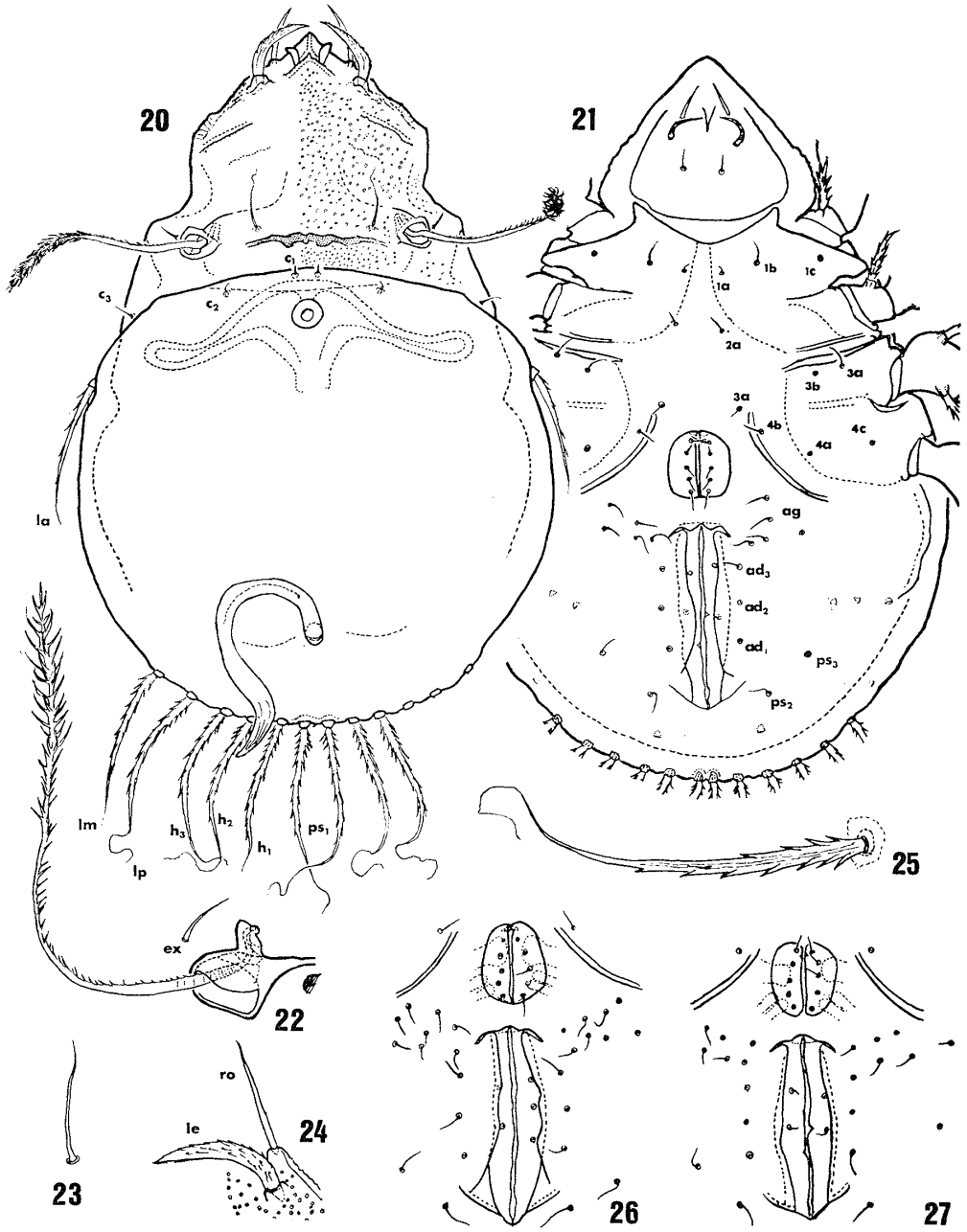
Gnathosoma. Chelicera of the normal type, its apices never attenuated. Seta *cha* a little longer than *chb*; both the setae weakly but clearly barbed. Trägårdh's organ *Tg* long, well recognized (Fig. 14). Tarsus of palp elongated. Palpal chaetotaxy: (2–1–3–7); number of setae on tarsus and tibia are uncertain; setae on femur, genu and tibia long, fairly barbed. Seta *h* on mentum as well as setae *a* and *m* on gena bent inward; seta *m* more strongly arched than the others; setae *m* and *h* fairly thick and barbed, whereas seta *a* glabrous and sharply pointed at tip. Mutual distance of the hypostomal setae: a–a<h–h<m–m. Rutellum bears two pointed apices overlapping and crossing each other; the inner apex provided with two rounded dents on its both faces (Fig. 13). On the median side of rutellum found two seta-like projections, seemingly representing adoral setae, finely attenuated and crossing each other. Dense granules of cerotegument covering most part of hypostom.

Legs. Legs as well as epimeral region covered by thick cerotegument. Segments of legs bearing very thick and strongly roughened setae (Figs. 16, 18, 43), which, however, never forms distinct pectinations as seen in *Basilobelba retiarius.* Solenidiotaxy: I (1–2–2);; II (1–1–2); III (1–1–0); IV (0–1–0). Solenidion φ_1 on tibia I normal in shape, slightly bent and similar in length to the associated dorsal seta *d*, but φ_2 short, spindle-shaped (Fig. 18). Tarsus I has 19 tactyle setae, 2 solenidia and 1 famulus. Solenidia ω_a and ω_p on tarsus I almost of the same length and their tips bent toward paraxial direction; famulus ε associates with ω_a and long, almost subequal to the length of the latter; the root of famulus ε very thick but it suddenly attenuating at tip (Fig. 16).

Tritonymph

Prodorsum. Rostrum pointed with a triangular projection, which is accompanied by a pair of smaller projections (Fig. 20). Rostral and lamellar setae situated near aside the rostral projections; *ro* thin and almost straight, whereas *le* thick, strongly barbed and bent inward; lamellar apophysis more distinct than rostral one (Fig. 24). Interlamellar seta very thin, having a fine curled tip (Fig. 23). The mutual distances of the three setae mentioned above: *ro*–*ro*<*le*–*le*≒*in*–*in*. Sensillus directed toward the dorsal direction, bearing distally a lot of spines (Fig. 22). Exobothridial seta minute. Of the main ridges on prodorsum, the chitinous transverse ridge between bothridia seems to be the most prominent; it is provided with a few irregular nodes. Anteromarginal ridge, on which the apophysis for lamellar seta is located, also well developed. Prodorsum entirely covered by granular cerotegument.

Notogaster. Ten pairs of setae found in dorsal aspect of notogaster. Three pairs of minute setae (c_1, c_2, c_3) inserted near anterior margin of notogaster, which is slightly convex. Seta c_3 located laterally outside of notogastral margin. A pair of humeral setae (*la*) and six pairs of caudal setae (ps_1, h_1, h_2, h_3, *lp*, *lm*) long, having distinct barbs; the caudal setae concentrated in a row, each bearing a fine tip strongly curled (Figs. 20, 25). A spiral, which connects to deutonymphal exuvia, arising



Figs. 20–27. *Basilobelba parmata* sp. nov., tritonymph. —— 20. Dorsal aspect (exuviae removed). 21. Ventral aspect. 22. Sensillus, bothridium and exobothridial seta. 23. Interlamellar seta. 24. Rostral and lamellar setae. 25. Caudal seta h_1. 26–27. Variation in ventral neotrichy.

from the posterior part of notogaster. Transparent tritonymphal buckle prepared seemingly under the surface; peg (*ve*) of the buckle well sclerotized.

Ventral side. Genital opening well recognized, just a little longer than wide,

whereas the anal opening is elongated. Five pairs of genital, 2 (3) pairs of anal and 3 pairs of adanal setae exist. Aggenital region shows neotrichy and the number of setae varies from 4 to 8 on each side; these setae usually paired but asymmetrically arranged (Figs. 21, 26–27). The other two pairs of setae (ps_2, ps_3) found posterolateral to the adanal region; five pairs of lyrifissures also seen in ventral view (Fig. 21). Formula of epimeral setae: (3–1–3–3).

Deutonymph and Protonymph

Deutonymph. Dorsal aspect of deutonymph very similar to that of tritonymph except for body size and structure of the anterior part of notogaster; instead of the buckle, there is a sclelotized squared part covered by granules of cerotegument. Ventral aspect also resembles that of tritonymph except that the deutonymphal genito-anal chaetotaxy is (3–0–0–3) as seen in Fig. 29.

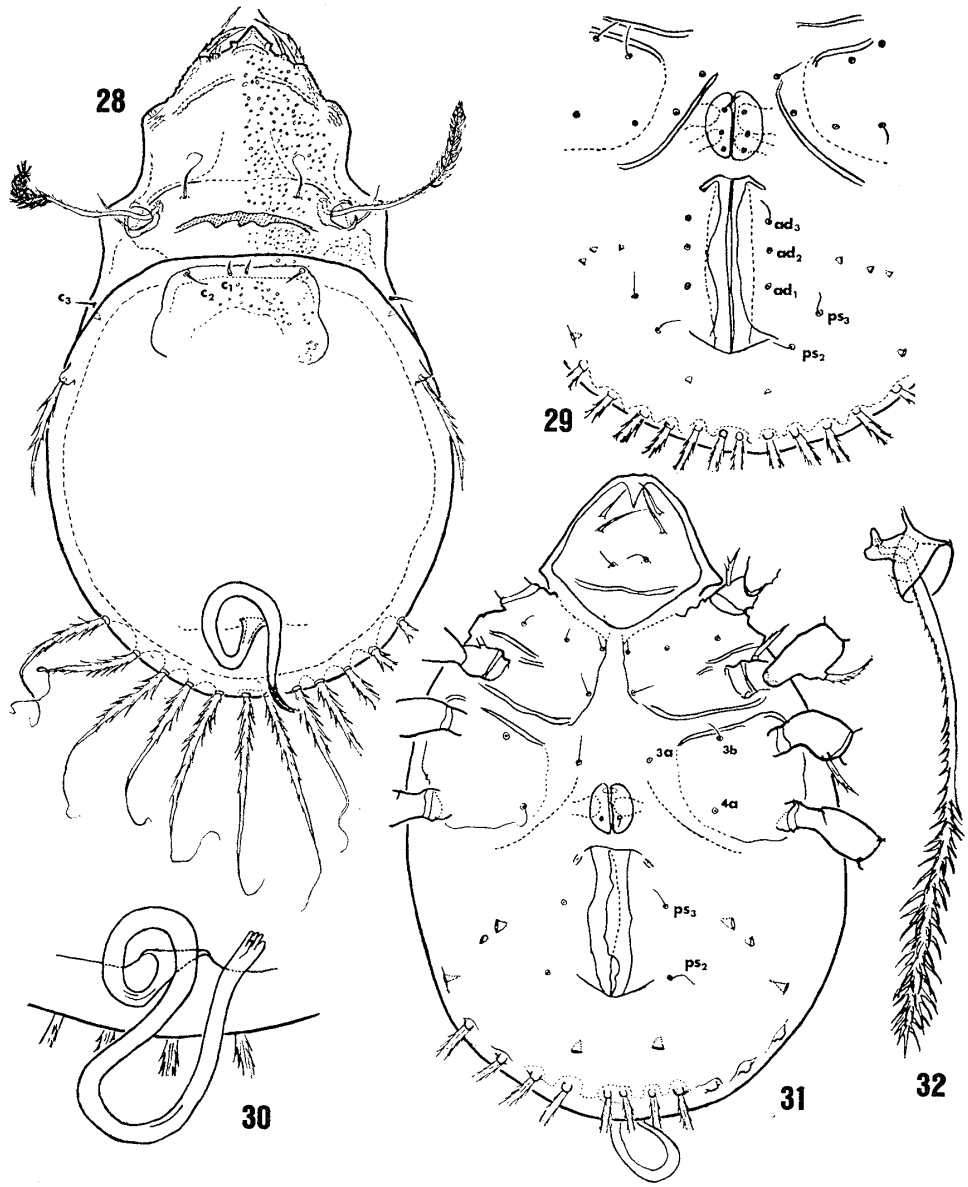
Protonymph. Protonymph has a caudal spiral connecting to larval exuvia; the tip of the spiral split, reminding us of a human hand, whereas that of deutonymphal or tritonymphal spiral is simple (Fig. 30). Protonymph shows formula of epimeral setae: (3–1–2–1) and genito-anal chaetotaxy: (1–0–0–0); four pairs of lyrifissures found in ventral aspect (Fig. 31). Other features resemble those of deutonymph.

Nymphal and Larval Exuviae

Tritonymphal exuvia. Each arm of tritonymphal exuvia very long, making a hairpin bent; thong of tritonymphal buckle short. Setae c_1 and c_2 situated on a thin film sticking on the arm; the film bearing some of the setae tends to be lost away: c_3 never found. Reticulation on tritonymphal exuvia widely vanishing in the anterior area; reticulation also disappearing in the round part posterior to the spiral (Fig. 38). Insertion pore for each tritonymphal caudal seta surrounded by a peculiar ring-like structure resembling the figure '8'; only the structure surrounding ps_1 elliptical (Figs. 38–39). Marginal reticulation broken and cut in pieces.

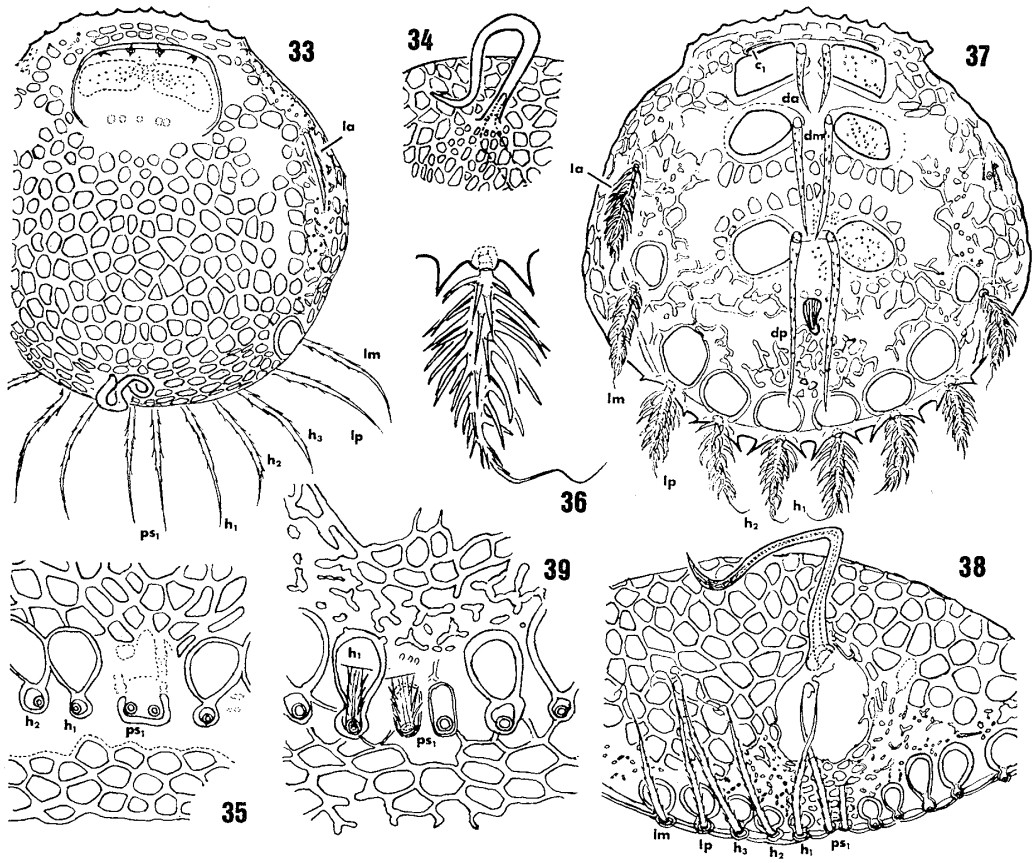
Deutonymphal and protonymphal exuviae. Deutonymphal and protonymphal exuviae similar in structure except for the tip of the spiral. Reticulation covers the exuvia except the three pairs of anterolateral areas and anterior squared area (Fig. 33); the latter observed in deutonymph or protonymph itself. Minute setae c_1 and c_2 found on the anterior margin of the square; c_3 not situated on the exuviae. Long nymphal setae (except humeral seta *la*) inserted in the peculiar ring-like structures like those of tritonymphal exuvia; a pair of posteriormost setae ps_1 arising from a single common frame (Fig. 35). Reticulation interrupted and cut in pieces laterally, but still keeping polygonal structure. Caudal part around spiral shows complete reticulation (Fig. 34). Deutonymphal spiral stuck by the tritonymphal spiral, which is the only connection between them; protonymphal exuvia also supported by deutonymphal spiral.

Larval exuvia. Larval exuvia much different in shape from that of nymphs,



Figs. 28–32. *Basilobelba parmata* sp. nov. —— 28–29. Deutonymph. 28. Dorsal aspect. 29. Anogenital region. 30–32. Protonymph. 30. Caudal part. 31. Ventral aspect. 32. Sensillus and bothridium.

showing a complicated pattern of reticulation (Fig. 37). Nine pairs of setae exist on larval exuvia. Five pairs of strongly feathered setae arranged marginally, each being inserted between a pair of spines (Figs. 36, 37). Three pairs of dorsal setae thick and strongly roughened; each pair situated close together, parallel and decumbent; the posterior pair very long ($da<dm<dp$). Marginal and dorsal setae except *la* associated each by a large round foveola near its base. Anteromarginally, only one pair of thin and pointed setae c_1 found in front of the associating foveolae for



Figs. 33–39. *Basilobelba parmata* sp. nov. —— 33. Protonymphal exuvia. 34. Spiral on deutonymphal exuvia. 35. Caudal part of deutonymphal exuvia. 36. Marginal feathered seta of larval exuvia. 37. Larval exuvia (notation of setae is rather arbitrary). 38. Caudal part of tritonymphal exuvia. 39. Enlarged figure of a part of Fig. 38.

da. Posterior to the insertions for *dp* found a chitinous mark, whose under surface is adhered to by the protonymphal spiral.

Postembryonic Development

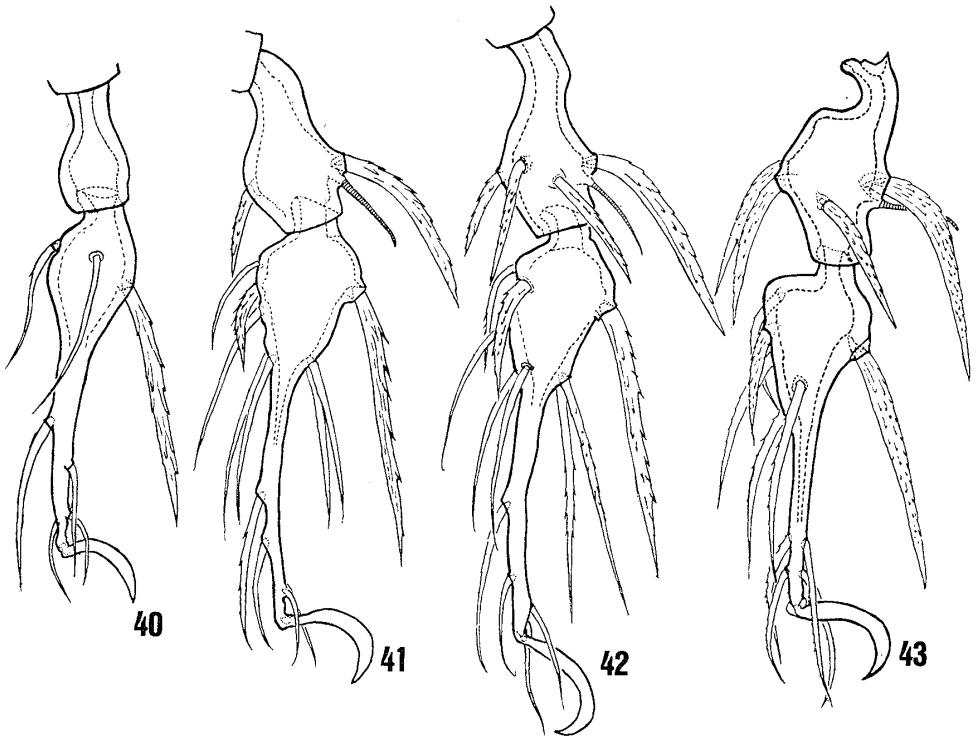
Postembryonic development of genito-anal and epimeral chaetotaxy is shown in Table 1. Chaetotaxy of tibia IV and that of tarsus IV are also given in Table 1 and Figs. 40–43. Tarsus IV of adult has smaller number of setae than that of tritonymph. Chaetotaxy of leg IV of protonymph: (0–0–0–0–7). Notogastral setae of nymphal stages equivalent to one another.

Type-series. Holotype (NSMT–Ac 9207, adult, in spirit) and 74 paratopotypes (52 adults, 12 tritonymphs, 7 deutonymphs, 3 protonymphs): Nagamine, Wado-mari-chô, Okinoerabu-jima Island, 50 m, 24–III–1980, *ex* litter under secondary subtropical forest by a river, S. Tanaka; 6 paratypes (5 adults, 1 deutonymph): Oyama, China-chô, Okinoerabu-jima Island, 200 m, 24–III–1980, S. Tanaka; 1

Table 1
Development of *Basilobelba parmata* sp. nov.

	Protonymph	Deutonymph	Tritonymph	Adult
Genito-anal chaetotaxy	(1–0–0–0)	(3–0–0–3)	(5–4～8–2–3)	(6–m*–2–m*)
Epimeral chaetotaxy	(3–1–2–1)	(3–1–3–3)	(3–1–3–3)	(3–1–3–3)
Tactyle setae on tibia IV	0	2	4	4
Solenidion on tibia IV	0	1	1	1
Setae on tarsus IV	7	12	12	10

* Number of setae on ventral plate: 26–31 (on each side).



Figs. 40–43. *Basilobelba parmata* sp. nov., Tarsus and tibia IV (antiaxial side). —— 40. Protonymph. 41. Deutonymph. 42. Tritonymph. 43. Adult.

paratype (adult): Near Shôryûdô Cave, Sumiyoshi, China-chô, Okino-erabujima Island, 120 m, 23–III–1980, S. Tanaka; 38 paratypes (34 adults, 2 tritonymphs, 2 deutonymphs): Near Ginryûdô Cave, Kenpuku, Isen-chô, Tokunoshima Island, 130 m, 21–III–1980, S. Tanaka; 1 paratype (adult): Sude, Setouchi-chô, Amami-Oshima Island, 50 m, 18–IV–1980, S. Tanaka; 1 paratype (adult): Shinokawa, Setouchi-chô, Amami-Oshima Island, 30 m, 18–IV–1980, S. Tanaka; 1 paratype (adult): Shin-mura, Sumiyô-chô, Amami-Oshima Island, 30 m, 18–IV–1980, S. Tanaka; 13 paratypes (adults): Near Yuhi River, Maekawa, Tamagusuku-son, Okinawa Island, 100 m, 27–III–1980, S. Tanaka; 1 paratype (adult): Yofuke, Nago City, Okinawa Island, 60 m, 30–III–1980, S. Tanaka; 1 paratype (adult): Nakaoshi, Nago City,

Okinawa Island, 80 m, 31–III–1980, S. Tanaka; 1 paratype (adult): Taminato, Ogimi-son, Okinawa Island, 10 m, 30–III–1980, S. Tanaka; 1 paratype (adult): Nuha, Ogimi-son, Okinawa Island, 50 m, 28–III–1980, S. Tanaka; 4 paratypes (adults): Sunny Park, Nagamine, Yaku Island, 11-XI-1974, J. Aoki; 9 paratypes (adults): N of Sekiri River, Seibu-rindo, Yaku Island, 17–XI–1974, J. Aoki; 7 paratypes (adults): Anbo, Yaku Island, 15–XI–1974, J. Aoki; 2 paratypes (adults): S of Nejime-chô, Ôsumi Peninsula, Kagoshima Prefecture, Kyushu, 21–III–1970, J. Aoki; 6 paratypes (adults): Nakanodaira, Hahajima, Ogasawara Islands, 4–VII–1970, T. Habe (extracted by J. Aoki). Holotype and a part of paratypes will be deposited in the collection of the National Science Museum, Tokyo.

Remarks. 1) If we evaluate the shape of chelicera as the most important character, the present new species clearly belongs to the genus *Basilobelba*. However, some characters of the species show some inconsistency with what was revised by Aoki (1968). The new species shows the strongest ventral neotrichy which even exceeds that of members of the genus *Xyphobelba*. The tritonymphal arms of the new species as well as *Basilobelba pacifica* Hammer, 1971, are very long and as wide as prodorsum. Hereby the two characters, ventral neotrichy and shape of tritonymphal arm, should be treated not as generic but specific ones. The author also re-examined the paratype specimen of *Xyphobelba setosa* Aoki, 1968, deposited in the National Science Museum, Tokyo, and found that solenidion φ_2 on tibia I is setiform (Fig. 19). According to Grandjean (1959), *Basilobelba retiarius* (Warburton, 1912) (=*Hammation sollertius*) has a spindle-shaped solenidion φ_2 on tibia I. Although it is assumed only from three species (*B. parmata*, *B. retiarius*, and *X. setosa*), the shape of solenidion φ_2 seems to be generic character, whereas the length of φ_1 is specific one. A new revision of the family Basilobelbidae is shown in Table 2.

2) The new species shows close relationship to *B. baltazarae* Corpuz-Raros, 1979 in the aspect of prodorsum, in the concentrated arrangement of tritonymphal caudal setae and in the rather strong ventral neotrichy. But the latter is easily distinguished

Table 2
Characters of some members of the family Basilobelbidae.

	B. retiarius	*B. pacifica*	*B. parmata*	*B. baltazarae*	*X. setosa*	*X. hamanni*
Chelicera	normal				peloptoid	
Genital aperture	smaller than anal aperture				larger than anal aperture	
Body length	420 μ	540 μ	410–440 μ	455–500 μ	690–750 μ	884 μ
Number in pairs of ventral setae	11	15	26–31	16–18	18–21	16
Solenidion φ_2 on tibia I	short, spindle-shaped	?	short, spindle-shaped	?	as long as *d*, setiform	?
Solenidion φ_1 on tibia I	much longer than *d*	?	as long as *d*	?	much longer than *d*	?

from the new species by (a) the tritonymphal seta *lm* situated laterally, (b) the tritonymphal reticulation filling also the anterior part, and (c) the smaller number (16–18 on each side) of setae on ventral plate.

3) *Basilobelba pacifica* shows the same way of attaching the exuviae as the new species, having caudal spiral. The other basilobelboid species wear nymphal exuviae by style and stylet. *B. pacifica* also bears some relationship to the new species in the habit of wearing larval exuviae. *B. pacifica*, *B. baltazarae* and *B. parmata* seems to be related in having conspicuous prodorsal ridges, though those of *B. pacifica* are quite different in shape.

Notes. The new species was found in many southern islands of Japan. From Minami-Daitô Island, located at mid-distance between two localities of the type-series (Okinawa and Ogasawara), *Basilobelba retiarius* was reported by Aoki (1980). The author re-examined the specimen from Minami-Daitô Island through the courtesy of Prof. Dr. Aoki, and determined it as *B. retiarius*, which is interesting from the biogeographical point of view.

ACKNOWLEDGEMENTS

The author wishes to express his hearty thanks to Prof. Dr. Jun-ichi Aoki of Yokohama National University for his kind instructions and encouragement. His sincere gratitude is also due to Mr. Shingo Tanaka of Kyushu University, who kindly shared the effort of providing the author with a lot of materials.

LITERATURE

Aoki, J., 1968. A new species of the genus *Xyphobelba* from New Britain Island (Acari, Cryptostigmata). *Bull. Natn. Sci. Mus., Tokyo*, **11**: 269–274.

———— 1976. Vertical distribution of oribatid mites in Yaku Island, South Japan. *Rev. Écol. Biol. Sol*, **13**: 93–102.

———— 1980. Faunal and ecological survey on soil micro-arthropods, especially oribatid mites of Minami-Daito Island. *Bull. Inst. Envirn. Sci. Techn. Yokohama Natn. Univ.*, **6** (1): 119–126. (In Japanese)

Csiszár, J., 1961. New oribatids from Indonesian soils (Acari). *Acta. Zool. Acad. Sci. Hung.*, **7**: 345–366.

Corpuz-Raros, L. A., 1979 a. Philippine Oribatei (Acarina). I Preliminary list of species and descriptions of forty new species. *Philipp. Agr.*, **62** (1): 1–82.

———— 1979 b. A redescription of the chaetotaxy of *Basilobelba baltazarae* Corpuz-Raros (Acarina: Oribatei). *Kalikasan, Philipp. J. Biol.*, **8** (1): 117–119.

Grandjean, F., 1959. *Hammation sollertius* n. g., n. sp. (Acarien, Oribate). *Mém. Mus. Hist. nat. Paris*, (A-Zool.), **16**: 173–198.

Hammer, M., 1971. On some oribatids from Viti levu, the Fiji Islands. *Biol. Skr. Dan. Vid. Selsk.*, **5** (6): 1–60, pls. 1–35.